

UBT “SMART City”: A Small-Scale City Ecosystem for Experimentation in Knowledge-Driven Urban Planning

Edmond Hajrizi

UBT

Email: ehajrizi@ubt-uni.net

Binak Beqaj

UBT

Email: bbeqaj@ubt-uni.net

Skender Kosumi

UBT

Email: skender.kosumi@ubt-uni.net

Shqiprim Ahmeti

UBT

Email: shqiprim.ahmeti@ubt-uni.net

Abstract

«SMART Cities» and its applications represent a high level of complexity, including the skills required for urban solutions based on new models of education, research and policy framework design. This paper elaborates a specific model named UBT “SMART City” (Small Scale Smart Sustain System) which represents an Entrepreneurial Innovation Ecosystem, which could also be used as a Test-Bed for Future and Innovative Urban Planning with a particular focus in education, future-planning concepts and emerging technologies. Located in an Area of 30.000 m², the model is the state-of-art Development Program, designed and developed by at University for Business and Technology (UBT), with the aim to modernize and integrate the sustainable and SMART planning, community living standards, advanced technologies, education, innovation and economic and social impact.

Keywords: Smart Cities; Emerging Technologies; Transformative Urban Planning; Sustainable Development; Innovation Ecosystem

1. Introduction and Theoretical Background

• The evolving needs in urban planning education

Higher education institutions play a critical role in advancing urban sustainability. Universities and colleges not only educate the next generation of leaders, planners, and professionals but also serve as hubs for research, innovation, and policy development. They are in a unique position to lead by example, demonstrating sustainable practices through their operations and campus management. Many universities have begun integrating sustainability into their curriculum, offering specialized courses, degrees, and certifications focused on environmental science, sustainable development, and urban planning. These programs equip students with the knowledge and skills needed to address complex sustainability challenges. Additionally, interdisciplinary approaches that combine aspects of engineering, economics, sociology, and environmental studies provide a holistic understanding of sustainability issues.

Research conducted within these institutions is invaluable for the advancement of urban sustainability. By exploring new technologies, materials, and methods, academic research can drive significant progress in areas such as renewable energy, sustainable architecture, and waste management. Universities can also influence policy by providing evidence-based recommendations to government bodies and urban planners.

Moreover, colleges and universities often act as microcosms of larger urban systems, where sustainable initiatives can be tested and refined. From energy-efficient buildings and sustainable transportation options to waste reduction programs, the sustainable practices implemented on campuses can serve as models for broader urban applications.

- The role of education and innovation ecosystems in future cities

Education and innovation ecosystems are crucial in shaping the sustainable, inclusive, and resilient cities of the future. As urban areas increasingly face multifaceted challenges—ranging from climate change and resource scarcity to demographic shifts and governance complexity—the need for well-informed, interdisciplinary, and technologically adaptive urban professionals is greater than ever (OECD, 2020).

Urban Planning Education (UPE) has undergone significant reform since the 1990s, moving beyond technocratic models of environmental management to embrace a sustainability-driven and participatory paradigm. Inspired by global frameworks such as the **Brundtland Report** (WCED, 1987), the **New Urban Agenda** (UN-Habitat, 2016), and the **2030 Agenda for Sustainable Development** (UN, 2015), modern UPE integrates principles of ecological integrity, equity, collaborative governance, and innovation. Contemporary curricula emphasize competences such as strategic foresight, anticipatory thinking, stakeholder negotiation, ethical reasoning, and systems-based problem solving—skills essential for planning in rapidly changing and culturally diverse environments (Friedmann, 1996; Gunder, 2010; D'Alessandro & Zuluaga, 2022).

At the heart of these efforts lies the integration of education with innovation ecosystems. Universities function as living laboratories and microcosms of cities, offering real-world contexts for testing sustainable solutions—from energy-efficient buildings and zero-waste systems to smart mobility networks (Cavada et al., 2016). Innovation ecosystems surrounding HEIs—including research institutes, start-up incubators, policy labs, and civic tech platforms—facilitate cross-sector collaboration, enabling the development and scaling of technologies that advance urban sustainability (Etzkowitz & Leydesdorff, 2000; Carayannis & Campbell, 2009).

The rise of advanced technologies—such as **Artificial Intelligence (AI)**, **Extended Reality (XR)**, the **Internet of Things (IoT)**, and **digital twins**—is redefining the possibilities of urban design, governance, and engagement. AI is increasingly used in predictive modeling, urban analytics, and optimizing resource management (Batty, 2018), while XR technologies (augmented and virtual reality) are transforming the way urban plans are visualized, communicated, and co-created with communities (Portman, Natapov & Fisher-Gewirtzman, 2015). These tools enhance spatial awareness, participatory planning, and scenario simulation, making urban development more inclusive and data-informed (Alizadehsalehi et al., 2020).

Education plays a critical role in equipping future professionals with the technical literacy and ethical frameworks needed to responsibly harness these technologies. Pedagogical approaches are evolving toward **learner-centered, experiential, and transformative models**. **Education for Sustainable Development (ESD)** promotes critical thinking, self-awareness, and systemic understanding, empowering learners to become agents of change (Sterling, 2001; UNESCO, 2017). Incorporating digital tools and immersive technologies into teaching methodologies not only enhances engagement but also fosters interdisciplinary collaboration and creativity (Mulder, 2017).

The paper frames current human development within the convergence era and the Fourth Industrial Revolution (4IR), characterized by the blending of physical, digital, and biological technologies. This era demands interdisciplinary approaches and transformations across political, social, economic, and technological systems, emphasizing sustainability, innovation, and resilience. Cities are viewed as complex adaptive systems requiring integrated governance and policy frameworks. Smart Cities are presented as ecosystems that integrate advanced technologies like IoT, AI, and 5G with urban infrastructure to improve efficiency, quality of life, and sustainability. UBT's Smart City model exemplifies this trend by combining technology, education, and community engagement in an innovation ecosystem that serves as a living lab for sustainable urban solutions.

Despite these promising frameworks, several challenges persist. Small-scale ecosystems such as UBT's Smart City testbed encounter limitations related to resource constraints, scalability, and complexity management. The intricacies of urban systems—spanning infrastructure, governance, and socio-economic factors—require adaptive and multi-level governance approaches to effectively manage complexity and scale innovations beyond localized pilot projects (Batty et al., 2012; Kitchin, 2014).

However, these limitations also offer unique opportunities. Testbeds like UBT's Smart City can serve as models for policy transfer, regional replication, and cross-border learning, especially in contexts of emerging economies where scalable smart city solutions are urgently needed (Albino, Berardi & Dangelico, 2015).

In the context of planning education, UBT's integrated Smart City initiative underscores the critical role of higher education institutions as catalysts for sustainable urban development and social innovation. The initiative's experiential learning environment equips future planners with competencies essential for navigating the complexity of smart urbanism, including systems thinking, anticipatory governance, and multi-stakeholder negotiation skills (Wiek et al., 2011).

Looking ahead, the future outlook for smart city development at UBT involves expanding the testbed's technological infrastructure, scaling pilot innovations to regional urban environments, and deepening partnerships among academia, government, and industry. This evolution will support the broader diffusion of data-driven governance practices that enhance urban resilience and inclusivity, thereby positioning UBT as a regional leader in smart city research and policy influence (Neirotti et al., 2014; Nam & Pardo, 2011).

2. SMART Cities: Concept, Definitions, key dimensions

By 2050, it is estimated that roughly 70% of the world's population will live in cities. With more citizens to serve, and a climate that is rapidly degrading, public service efficiency and effective resource-usage are becoming pressing issues for cities. In this context, ensuring sustainable development and quality of life in complex social ecosystems of cities and urban areas are important concerns. Cities are increasingly aware of the concept of "smart city" and are actively developing strategies towards the goal of becoming "smart" and manage city resources more efficiently while addressing development and inclusion challenges. To understand the concept of smart city, we begin with understanding the conceptual relatives of the model. Although limited in scope, they set the theoretical framework for the holistic notion of the smart city currently understood by the urban planning sphere. The notion of smart city is established from the combination of the knowledge society and digital city. It is defined as a "multi-layer territorial system of innovation" made up of digital networks, individual intellectual capital, and the social capital of the city, which together constitute collective intelligence (Kominos, 2008). Economic competitiveness and innovation achieved through the knowledge-based economy marks a city as intelligent, allowing it to generate a "spatial competitive advantage" through industrial districts, regions, and learning clusters that produce sophisticated R&D and are supported by digital networks and artificial intelligence (Kominos 2008). Based on the exploration of a wide and extensive array of literature from various disciplinary areas, the identified factors- Social, Management, Economy, Environment, Technology, Sustainability, (SMEETS) forms the basis of an integrative framework. This comprehensiveness is the distinguishing factor of the smart city, which integrates a number of physical, institutional, and digital components to create a holistic definition of what smart planning would look like.

• Pillars of Smart City

The structure of smart city is widely comprised by six pillars, namely 1) Social; 2) Management, 3) Economy; 4) Environment; 5) Technology; and 6) Sustainability.

At its core, a smart city framework leverages from the existing legal, economic and technical environment and impacts the social and management aspects in a sustainable manner. Setting a smart city vision and effectively moving towards it with a systems-based approach is imperative to ensure optimum resource efficiency and security, along with preserving socially inclusive growth. Drawing on the literature and the factors considered above, we have conceptualized an integrative framework that explains the relationships between these factors in a more coherent fashion. We have named it as SMEETS framework (Social, Management, Economy, Environment, technology and Sustainability). Each of these factors enables both the public and private sectors to plan and implement Smart City initiatives more commendably. These elements provide a basis for matching how different cities are envisaging their smart initiatives, employing shared services, and the related challenges. This framework also analyses the actual impact of different factors on the success of smart city initiatives. The framework

indicates that each factor is both affecting and getting affected by each other factor. It also indicates that some factors may be more influential than the others depending on the context. The framework can be bifurcated in two levels. The inner level consists of the factors, which have greater impact on the smart city initiatives. This also consists of technology, which is the foundation of smart cities. The outer level factors are the ones, which might get influenced by the inner level before impacting the smart city initiatives. This includes governance and the socio balance of the community apart from sustainability, which should be the basis of any development.



Fig.1. Smart City Framework

A contextually adapted and citizen-centric approach ^[2], using both human and technological resources, can bring multiple benefits for municipalities, particularly those that are struggling with specific problems - such as inefficient waste management systems, lack of civic participation, or traffic and congestion.

• Definitions and Terminology

A **smart city** is an urban area that uses different types of electronic Internet of things (IoT) sensors to collect data and then use these data to manage assets and resources efficiently. This includes data collected from citizens, devices, and assets that is processed and analyzed to monitor and manage traffic and transportation systems, power plants, water supply networks, waste management, crime detection,^[1] information systems, schools, libraries, hospitals, and other community services.^{[2][3][page needed]}

The smart city concept integrates information and communication technology (ICT), and various physical devices connected to the IoT network to optimize the efficiency of city operations and services and connect to citizens.^[4]

^[5] Smart city technology allows city officials to interact directly with both community and city infrastructure and to monitor what is happening in the city and how the city is evolving. ICT is used to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption and to increase contact between citizens and government.^[6] Yet, the term itself remains unclear to its specifics and therefore, open to many interpretations.^[10]

Terminology

Due to the breadth of technologies that have been implemented under the smart city label, it is difficult to distill a precise definition of a smart city.

Deakin defines the smart city as one that utilizes ICT to meet the demands of the market (the citizens of the city),

and that community involvement in the process is necessary for a smart city.^[27] A smart city would thus be a city that not only possesses ICT technology in particular areas, but has also implemented this technology in a manner that positively impacts the local community.

• Characteristics

It has been suggested that a smart city (also community, business cluster, urban agglomeration or region) uses information technologies to:

1. Make more efficient use of physical infrastructure (roads, built environment and other physical assets) through artificial intelligence and data analytics to support a strong and healthy economic, social, cultural development.^[36]
2. Engage effectively with local people in local governance and decision by use of open innovation processes and e-participation, improving the collective intelligence of the city's institutions through e-governance,^[7] with emphasis placed on citizen participation and co-design.^{[37][38][39]}
3. Learn, adapt and innovate and thereby respond more effectively and promptly to changing circumstances by improving the intelligence of the city.^{[7][40]}

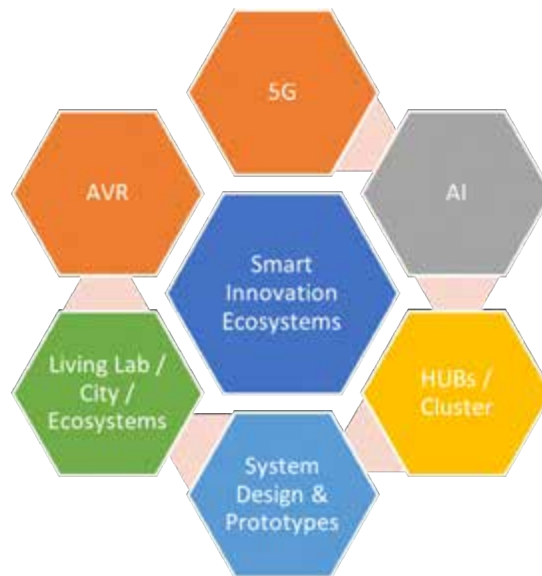
According to David K. Owens, the former executive vice president of the Edison Electric Institute, two key elements that a smart city must have are an integrated communications platform and a "dynamic resilient grid." Both are large investments.^[46]

3. The UBT "SMART City" Concept

In the context of smart city development, focusing on the functions of everyday urban life is essential to understanding how new technologies and integrated approaches transform living spaces. A unique example in this regard is the **"UBT Smart Self-Sustain System"**, developed by the University for Business and Technology (UBT) in Kosovo. This model represents an innovative and holistic approach aimed at creating a **"city of knowledge"**—an environment where education, technology, healthcare, employment, housing, and community life are intertwined in an integrated ecosystem.

Since its beginnings UBT has always followed the current technological and socio-economic trends and developments, while in certain situations it has taken the leading role towards future oriented solutions and forward-looking initiatives. In these terms, UBT now bases its scientific, research, teaching and innovation activities on the UNIVERSITY 4.0 Concept, by integrating Fully Digitalized Research and Education Process, CLASSROOM 3.0, Augmented and Virtual Reality (AVR) and 5G Telecommunication Network in its main Innovative and Scientific Campus in Lipjan/Kosovo and its other campuses and premises around Kosovo. The campus has been designed and developed around the small-scale smart city concept by covering all fields of life occurring in an open campus.

UBT Model for Fyly Smart based University is fellow:



This model integrates Smart Systems, Resilience and Sustainability, also the concept of Society 5.0.

At the core of this concept lies the idea of transforming traditional urban functions through advanced technologies and practical learning. This **smart ecosystem** includes more than **150 fields of study**, **300 laboratories**, and a network of **80 functional companies** where students actively engage throughout their studies. **Practical experience and real-world learning** are embedded in every aspect of life, creating a new model for education and professional training.

Urban life functions—such as education, employment, technology, healthcare, public services, culture, and social infrastructure—are integrated into this system. For instance, in the field of healthcare, UBT has built a functional hospital and polyclinic, while in technology, it operates software companies and 5G networks. In the media field, the university has its own radio, television, and news portal, enabling students to directly participate in media content production and digital platform development. Another important aspect of this model is the use of advanced technologies such as **5G, artificial intelligence, virtual reality, robotics, cloud computing, and laser technologies**. These technologies are not only present in laboratories or classrooms but are part of the campus's daily life, offering an integrated learning and working experience. Students learn by solving real-world problems, participating in concrete projects, and collaborating with industry experts, transforming the campus into a **living urban ecosystem**. This system not only meets the demands of modern education but also generates **thousands of new jobs every year**, ensuring a seamless transition from education to employment. The integration of technology, professional practice, and core urban life functions makes this model valuable for study in the context of smart cities, where **innovation, social inclusion, and economic development** converge to create a **sustainable and livable environment**. This approach challenges traditional models of education and urban development, proposing a new paradigm that can inspire the cities of the future.

4. Physical and Technological Components

Campuses and Premises

UBT operates across multiple locations, with main campuses in Prishtina and Lipjan, and branches in Prizren, Gjiilan, Ferizaj, and Peja. Its total campus area spans approximately 65,000 m², covering open spaces, green areas,

and parking, with major facilities including the Innovation Campus, City Center Campus, and University Hospital Campus. UBT is home to a community of 15,000 members, comprised by students, staff, and third part community.

To better address emerging needs of physical and operation transformation, UBT has developed its Institutional Strategy and Action Plan for a Green, Carbon-Neutral and Smart Campus. The project focuses on nine key Initiatives, namely: Clean Energy, Building green, Getting around, Sustainable water management, Good food, Zero plastics, Smart technologies, Sustainable landscape, and Print responsibly. The given Initiatives-directly linked with certain SDGs- and related actions & project are briefly summarized below:

Clean Energy / Switch to Renewables: From 252 kWp of electricity need for its campus and premises, UBT premises are generating 50 % of it (126 kWp) from already installed solar panels – and thus from renewable resources. Currently, the institution is looking forward install the rest of panels needed to generate 100 of its electricity by solar panels. This will make the campus and its premises a 100 % renewable energy-based campus.

Building Green/Green Building: The Initiative of “Building green” emphasizes the need for sustainable construction practices and ongoing maintenance to ensure that buildings remain environmentally friendly over time. By incorporating sustainable design, choosing eco-friendly materials, implementing energy-efficient systems, incorporating renewable energy sources, and establishing an ongoing maintenance plan, our campus can create buildings that have a positive impact on the environment and contribute to a green future.

Getting Around / Biking and Walking: Promoting non-motorized transportation options will reduce carbon emissions and foster a healthier lifestyle by developing a campus Master Plan, installing bike racks, implementing a bike share program, promoting biking and walking events, and integrating with public transport.

Never Waste a Drop / Sustainable Water Management: By conducting a water audit, implementing water-efficient fixtures and appliances, implementing rainwater harvesting and greywater recycling systems, improving landscape irrigation practices, and educating and engaging the campus community, UBT campuses are reducing water consumption, conserve resources, and minimize environmental impact.

Good Food, Healthy Planet / Zero Food Waste Campus: By implementing a sustainable sourcing policy, implementing portion control and food recovery programs, implementing a composting program, educating and engaging the campus community, and measuring and monitoring food waste, UBT campuses can contribute to a healthier environment and support a carbon-neutral future.

Zero Plastics, Zero Waste/Single-Use Plastic Free Campus and Minimization of Disposable Items: By implementing a ban on single-use plastics, promoting reusable items, establishing recycling and composting stations, organizing waste reduction and recycling programs, and educating and engaging the campus community, UBT campuses are going to significantly reduce their reliance on disposable plastic products and move towards a Zero Waste future.

When it comes to Principle 6.1- **Minimization of Disposable Items**, it particularly emphasizes reducing the reliance on single-use items in campus' everyday activities, with a particular focus on various faculties, including Medicine and its branches, Nursing, Agriculture and Environmental Engineering, and Food Processing and Biotechnology. This involves identifying alternatives, implementing recycling programs, and promoting responsible usage to minimize waste and promote sustainability. In conclusion, Minimization of Disposable Items underscores the importance of reducing reliance on single-use items in various faculties, including Medicine and its branches, Nursing, Agriculture and Environmental Engineering, and Food Processing and Biotechnology.

Adopting Smart Technologies/AVR: Integration of smart technologies will enhance efficiency, sustainability, and learning experiences by integrating smart building systems, incorporating AVR technologies, implementing IoT

solutions, promoting remote learning, and developing smart campus initiatives.

Sustainable Landscape / Open and Green Areas: The Initiative of “Sustainable Landscape / Open and Green Areas” focuses on creating and maintaining outdoor spaces that are ecologically sustainable and enhance the quality of life on campus. This approach emphasizes using native plants, conserving water, promoting biodiversity, and providing areas for relaxation and recreation.

Print Responsibly/Save the Planet: The Initiative of “Print Responsibly / Save the Planet” emphasizes the need to reduce paper consumption and minimize the environmental impact of printing activities on campus. By promoting responsible printing practices, campuses can conserve resources, reduce waste, and contribute to a more sustainable and Eco-Friendly environment.

The Institution is already implementing all mentioned initiatives, with most of them being fully implemented, and with the rest of initiatives being particularly addressed. Thus, this project proposal contains four important dimensions, namely as following:

- a) Description of Green and Carbon Neutral Campus Initiative in context of Institution's long term and strategic orientation
- b) Elaborating nine initiatives for making our campus Green, Carbon-Neutral and Smart, including concrete projects to be implemented and actions to be performed
- c) Identifying concrete steps, actions and projects that are put in place already
- d) Identifying ongoing actions and projects in order to fully implement Institution's initiatives and objective for making its campus Green, Carbon-Neutral and Smart.

Applying Crisis Management Principles in real life and university's everyday operations

The University for Business and Technology (UBT) has developed a robust framework for Institutional Crisis Management, encompassing resilience, economic and financial stability, and technological safeguards. This multi-dimensional strategy ensures UBT's preparedness for diverse challenges, aligning with its commitment to sustainability, operational continuity, and global excellence. Central to this approach are the following pillars: **a) the Sustainable Campus Resilience Program (SCRPP); b) an Integrated Program for the Resource Diversification and c) Cyber Security Measures Package-** with the triplet integrating environmental sustainability, economic diversification, and technological innovation into a cohesive crisis management model.

UBT strengthens institutional adaptability through resilience-focused initiatives such as the Climate Crisis Response Team, renewable energy implementation, and comprehensive sustainable practices. These efforts align with the Sustainable Development Goals (SDGs), fostering environmental stewardship and institutional readiness for crises, including natural disasters and infrastructure disruptions. UBT continuously evolves its resilience strategies to address emerging risks, ensuring adaptability in a dynamic global landscape. To safeguard economic stability, UBT diversifies its income sources through over 100 Spin-Offs, international research projects, and sustainable procurement practices. These initiatives generate sustainable revenue while providing practical learning opportunities for students and bridging academia with industry. In the technological domain, UBT prioritizes cybersecurity by establishing a Computer Emergency Response Team (CERT), investing in secure IT infrastructure, and incorporating advanced technologies like artificial intelligence for threat detection. The institution's three-pronged strategy—readiness, response, and recovery—ensures robust defenses against evolving digital threats.

Resilience: Strengthening Institutional Adaptability through the Sustainable Campus Resilience Program (SCRPP):

Resilience is the cornerstone of UBT's crisis management strategy, enabling the institution to adapt and thrive amidst adversities. UBT's SCRPP drives this adaptability by addressing critical dimensions of environmental sustainability and climate crisis management through initiatives such as:

- **Climate Crisis Response Team:** A dedicated team of experts prepared to address environmental risks and enhance institutional readiness. Their task include producing strategic documents and follow-ups of the fulfillment of the strategic objectives of these documents by aligning those with university's everyday operations and practices.

- **Institutional Strategy on Implementing and Promoting SDG-s:** The University has developed an extensive university strategy for dealing with the 17 Sustainable Development Goals (SDGs)- a comprehensive and integrated approach that aims to ensure that the university plays an active role in promoting sustainability across its operations, research, curriculum, community engagement, and institutional culture.

- **Renewable Energy Solutions:** Implementation of solar panels and other renewable technologies to transition UBT's campuses towards carbon neutrality.

- **Sustainable Practices:** Comprehensive recycling programs, water conservation initiatives, and promotion of non-motorized transportation options to minimize environmental impact.

- **Smart Building Practices:** Adoption of advanced technologies for energy efficiency, resource management, and user comfort across all UBT campuses. This includes integrating smart lighting systems, energy monitoring tools, and automated climate control to optimize resource utilization and create sustainable learning environments.

- **Education and Awareness:** Integration of resilience-focused modules into academic curricula, fostering a culture of preparedness and environmental stewardship among students and staff.

Economic and Financial Stability: Diversification as a Shield

UBT recognizes the critical importance of financial resilience in navigating economic disruptions. To this end, the university has adopted a multi-faceted approach to diversify its income sources and mitigate financial risks. Key initiatives include:

- **Spin-Off Ecosystem:** UBT has established over 100 Spin-Offs that generate sustainable revenue while providing valuable services such as business incubation, strategic consulting, ICT solutions, and engineering projects. These Spin-Offs also offer students practical learning opportunities, bridging the gap between academia and industry.

- **International Projects Office:** By participating in and managing international research and development projects, UBT secures funding to support its strategic objectives and operational needs.

- **Sustainable Procurement Practices:** Integrating sustainability criteria into procurement and supply chain management ensures responsible business practices and enhances economic stability.

- **Financial Contingency Planning:** UBT has developed comprehensive financial strategies to address potential enrollment fluctuations due to demographic challenges like migration and low population growth.

UBT's financial resilience strategy is bolstered by its focus on long-term planning and resource optimization. The institution continuously identifies new opportunities for revenue generation, such as partnerships with industry leaders, regional economic collaborations, and consultancy services tailored to public and private sector needs.

Technological Stability and Cyber Security: Safeguarding the Digital Future

In an increasingly digital world, technological stability and cybersecurity are essential components of UBT's crisis management framework. The university's approach includes:

- **Computer Emergency Response Team (CERT):** A specialized team dedicated to monitoring, preventing, and responding to cyber threats.
- **Secure IT Infrastructure:** Investment in secure and resilient systems to support online education, administrative operations, and research activities.
- **Continuous Monitoring and Training:** Regular simulation exercises and training programs to prepare staff and students for potential cyber crises.
- **Promoting Cyber Hygiene:** Educating the UBT community on best practices for safeguarding digital assets and maintaining vigilance against cyber risks.

UBT's cyber strategy is structured around three pillars: readiness, response, and recovery. This ensures the institution remains secure, vigilant, and resilient against evolving technological threats.

UBT has also integrated advanced technologies such as artificial intelligence and machine learning into its cybersecurity measures, enhancing its ability to predict, detect, and neutralize threats in real time. Additionally, the university collaborates with global cybersecurity experts to stay ahead of emerging threats and adopt best practices.

Entrepreneurship

Entrepreneurship and Innovation are priorities within UBT and due to this fact, UBT has managed to create innovations that have created a long-standing impact on society and that include large ecosystems of knowledge that bring the best and most popular practices of the world to Kosovo. A majority of these practices are the first in the Western Balkans and beyond. UBT's approach to entrepreneurship and innovation is completely different from traditional approaches. By providing many opportunities for students, staff, industry, third parts, and the wider community to develop their ideas and entrepreneurial skills and by enabling them to incubate, grow and get into the market. UBT has constantly invested in developing new education and business venturing concepts, focusing also on creating an environment conducive to entrepreneurial activity that also fosters and inspires the entrepreneurial spirit. Advising and mentoring students, staff, industry, third parts and wider community throughout projects that can be funded donors and industry is an effective method and we expect to further strengthen

So far, more than 30 impactful innovations have been generated, and more innovative projects are being developed and expected to make significant impact for our students, partners, relevant stakeholders and the wider community. These initiatives include developing a **Full-Scale Entrepreneurial Ecosystem** which cultivates a culture of innovation and entrepreneurship within emerging technologies like augmented reality (AR), AI etc. The given ecosystem encourages cross-disciplinary collaboration to turn ideas and research into real-world applications, and supporting startups that arise from the university's incubation programs. In this regard, beside establishing **more than 100 Spin-Offs**, UBT has also established the first innovative center in the region, named **"UBT Accelerator"**. Opened in the Innovative Science Park of UBT, this Accelerator has been in the service of students, staff, industry, and wider community for the development of creative, innovative ideas and the creation of technological advantages.

Furtherly; based on its strategic commitment to foster and support entrepreneurship, UBT has undertaken the following initiatives and has performed the following projects **UBT Start-Up School; 5G Technology Test-Bed; Center of Virtual and Augmented Reality; Artificial Intelligence Lab**, Internet of Things (IoT) Lab, Robotics and Industrial Automation; UBT Smart City Small-Scale Ecosystem; **National Cyber Security and Resilience Lab; UBT Research Hubs; UBT Junior Hub; UBT Sport, E-Sport & Art Hub; UBT Innovation and Technology Hubs; UBT Knowledge Hub; Tailored Manufacturing and Services; Remote/Contactless Delivery Services; Creativity Industry Hub; Central Testing Hub; Smart, Green and Carbon-Neutral Campus; UBT EdTech; UBT Digital Innovation Hub; National**

Public Policy Simulation Lab; UBT Integrated Media Center; UBT GIS and Spatial Data Infrastructure Center; UBT High Schools; UBT Professional Schools; Virtualization based Delivery Services; UBT Community Services; UBT Integrated Health Care Services; UBT University 4.0; UBT Go International; UBT Science and Technology Park etc.

When it comes to Spin-Off-s; the followings are only a few among over 100 Spin-Off-s of UBT: **IEME** (Institute for Enterprise Management and Engineering); **Quality Kosova** (Kosovo Association for Management – member of International Project Management Association and European Organisation for Quality) **CA-CASE** (Kosovo Association for Control, Automation and Systems Engineering – member of International Federation of Automation and Control); **KA-SIM** (Kosovo Association for Modelling and Simulation-Member of EUROSIM European Federation of Simulation Associations); **IES** (Intellectual Excellence Service); **IFC** (International Professional Certification and Evaluation); **UBC** (Budapest Joint Transformative Research Centre- jointly with University of Budapest for Technology and Economics and Szent Istvan University); **EON-UBT** (Joint Excellence Centre of Augmented and Virtual Reality – Immersive Technology); **UBT Institute for Urban Studies and Spatial Planning** etc.

“Hub Revolution Your Start Up” Center: In October 2024, UBT inaugurated this center in collaboration with Italian partners at its Smart City campus in Lipjan. The hub serves as an innovation and professional development center, fostering dialogue between academia and business to facilitate knowledge transfer and entrepreneurship.

Gold Venture Investments Western Balkan: Established in partnership with Israel's GVI Global, this company aims to support startups, public and private enterprises, and the civil society sector across the Western Balkans, contributing to sustainable economic development and international market expansion.

Thus; UBT has been playing a crucial role, both in developing the ethos and systems of a smarter society and giving people hope through supporting their journey to attain qualifications, engage in research, development work or entrepreneurial endeavor. UBT has contributed to enhancing employability prospects and personal fulfilment for various segments of the population availing of our services. The Institution has specifically made a mark in helping Kosovo become a member in international bodies, as such as IPMA, EOQ, IFAC, EUROSIM etc.

When it comes to written statements and public engagement toward entrepreneurship, it is important to refer the UBT Integrated Strategy 2027, which is constituted by the following objectives, among others:

- UBT will foster four challenges to regional and global needs: Caring for our environment: environmental science, design, engineering, architecture and social structure; Promoting wellness in our communities: access and equity in education and health outcomes, community-based participatory research, biomedical sciences and entrepreneurship; Food and fuel security: sustainable food systems, precision agriculture, energy production, transmission and storage; Securing the future: cybersecurity, governance and public policy.
- “UBT College will enhance education of undergraduates and graduate students through increased participation in **research, creative and entrepreneurial activities** by 10% by 2022”;
- UBT Students will be encouraged to consider **entrepreneurship as a career option** through extracurricular awareness and taster programs, as well as embedded modules, assignments or dedicated degree programs within the UBT suite of curricula.

The university's establishment of over 100 spin-offs and its proactive role in creating more than 80 business functions reflect the broader economic revitalization efforts in Kosovo. UBT's initiatives, such as the UBT Science and Technology Park and the EON Virtual and Augmented Reality Center, illustrate its commitment to advancing technology and fostering a vibrant entrepreneurial ecosystem.

UBT's growth and impact have been profound. It has become a central player in Kosovo's economy, significantly contributing to the job market and individual sectors. For example, 65% of ICT sector employees hold UBT degrees and over 1,000 jobs are created annually through the UBT Ecosystem – including its Spin-Offs, UBT Alumni and newly-established independent businesses supported by the UBT Accelerator – highlighting UBT's direct and

fundamental contribution to Kosovo's growth. The university's international acclaim, including awards like the "European Young Entrepreneurial University of the Year" and high rankings in global university assessments, underscores its pivotal role in positioning Kosovo as a hub for innovation and skilled labor. This is also a reflection on Prof Hajrizi, who understood the needs of his region and created the right opportunities for its development in key sectors.

8. Impacts and Lessons Learned

The implementation and ongoing development of the UBT "SMART City" model—designed as a Small-Scale Smart Sustainable System—has generated multiple layered impacts, particularly within the fields of education, urban planning, and socio-economic-environmental transformation. These impacts can be summarized as follows:

Educational Impact

The UBT "SMART City" has demonstrated significant educational value by fostering future-ready competencies through the integration of theoretical knowledge and practical skills. The model serves as a vibrant community center for experiential learning and interdisciplinary education, enabling students, academicians, and others researchers to use and benefit from emerging technologies such as AI, IoT, AVR, and digital twins. This environment facilitates **skill development in systems thinking, urban innovation, and digital transformation**, while also promoting **knowledge integration across engineering, policy development, urban planning and design, ICT, and sustainability practices**. By incorporating methodologies such as life-cycle-based design and user-centered approaches, the model cultivates problem-solving capabilities aligned with the demands of the 4th Industrial Revolution.

Urban Planning Impact

From a spatial planning perspective, the UBT "SMART City" provides a **scalable and transferable framework** that models how smart infrastructure and urban services can co-exist in a compact, integrated ecosystem. This approach introduces **new planning tools**, including dynamic land-use systems, place-based innovation ecosystems, and real-time feedback. As such, it contributes to a **cultural shift in planning**, moving from static, top-down approaches to **adaptive urbanism**. The model aligns with global trends toward compact, walkable urban forms—similar to the "15-minute city" which could be replicated in bigger scale of urban environments.

Socio-Economic and Environmental Contributions

The UBT "SMART City" Model lies in its ability to support **entrepreneurship, innovation, and job creation** within a community-centric environment. The embedded innovation hubs, spin-offs, and research centers contribute to local development by supporting knowledge-based economies. Moreover, the integration of **sustainable energy systems, green spaces, water and waste management and recycling** reinforces the model's alignment with climate transition.

Finally, the UBT "SMART City" illustrates the necessity of **multidisciplinary collaboration, user involvement, and iterative design testing** in smart urban development. As such, the model stands as an innovative model of convergence between **pedagogy, urbanism, and technology**, by offering a replicable paradigm for next-generation urban transformation.

9. Challenges and Opportunities

Small-scale entrepreneurial ecosystems, such as those developed by UBT in Kosovo, face inherent limitations that constrain their growth and broader economic impact. These limitations often arise from constrained financial resources, limited local markets, and underdeveloped institutional infrastructure necessary for innovation scaling (Stam, 2015). Although UBT has generated over 30 impactful innovations and more than 100 spin-offs, the size and economic capacity of the local environment limit startups' potential for sustainable market expansion and scaling (Isenberg, 2011). Moreover, emerging ecosystems typically encounter challenges related to immature regulatory frameworks and insufficient access to venture capital, which restrict the transition of ideas from incubation to commercialization (Spigel, 2017).

Managing complexity within such ecosystems requires effective governance and multi-stakeholder collaboration involving academia, industry, government, and civil society (Cohen, 2006). UBT's model integrates education, research, incubation, and acceleration functions to foster cross-disciplinary cooperation, which is critical in innovation ecosystems (Autio, 2014). However, scaling these systems demands overcoming structural bottlenecks, such as fragmented markets and limited human capital specialized in emerging technologies like artificial intelligence and augmented reality (Mason & Brown, 2014). Furthermore, the presence of multiple innovation hubs necessitates coordinated resource allocation to avoid duplication and ensure ecosystem cohesion (Martin & Sunley, 2011). Investments in infrastructure and capacity building are pivotal to support the adoption and diffusion of new technologies (Feldman & Zoller, 2012).

The experience of UBT's entrepreneurial ecosystem reveals significant opportunities for policy transfer, regional replication, and cross-border learning. Given the socio-economic similarities within the Western Balkans, best practices developed in Kosovo can inform regional policy frameworks to promote entrepreneurship and innovation (Rogers, 2003). UBT's partnerships, such as the Gold Venture Investments Western Balkan collaboration and memberships in international bodies like IPMA and EUROSIM, facilitate knowledge exchange and the harmonization of innovation policies (Bercovitz & Feldman, 2008). Innovation hubs like "Hub Revolution Your Start Up" serve as platforms to foster dialogue between academia and business, enabling replication of ecosystem components in neighboring countries with contextual adjustments (Bathelt, Malmberg & Maskell, 2004). Cross-border learning accelerates ecosystem development by integrating diverse experiences and catalyzing regional innovation clusters (Asheim & Isaksen, 2002).

In conclusion, small-scale entrepreneurial ecosystems face limitations related to market size, funding, and institutional maturity, making complexity management and strategic scaling critical for sustainable growth. UBT's integrated ecosystem approach provides a valuable framework for addressing these challenges. Leveraging opportunities for policy transfer and cross-border collaboration can expand the ecosystem's impact, contributing to economic development and innovation capacity building across the Western Balkans region.

10. Conclusion and Future Outlook

UBT's "SMART City" initiative serves as a crucial testbed for future urban planning, enabling applied experimentation with emerging technologies such as the Internet of Things (IoT), artificial intelligence (AI), and augmented reality (AR) within an integrated urban environment. As Prof. Skender Kosumi emphasizes, this living laboratory approach allows researchers and practitioners to analyze complex urban systems in real time, facilitating the development of scalable, adaptive solutions to pressing challenges like energy efficiency, mobility, and environmental sustainability (Batty et al., 2012; Cocchia, 2014). The UBT SMART City campus in Lipjan exemplifies how testbeds can accelerate innovation diffusion and provide empirical data essential for evidence-based planning (Townsend, 2013).

From an educational perspective, the initiative significantly enriches planning curricula by fostering experiential learning and interdisciplinary collaboration. Engaging students directly with cutting-edge technologies cultivates competencies in systems thinking, data analytics, and participatory governance, skills identified as essential for contemporary urban planners (Wiek et al., 2011; Angelidou, 2015). Moreover, embedding the SMART City concept within an entrepreneurial ecosystem aligns with calls for integrating innovation and sustainability into planning education to prepare graduates for dynamic urban futures (Haughton & Hunter, 2004; Sisson & Stough, 2017).

Key lessons for educators, planners, and policymakers emerging from the UBT experience include the necessity of embedding adaptive, technology-driven frameworks within urban planning and education to respond flexibly to rapid technological advances and complex social dynamics (Caragliu et al., 2011; Dameri, 2013).

Looking forward, the vision for UBT's SMART City involves expanding technological infrastructure, deepening multi-stakeholder collaborations, and scaling pilot projects to influence broader urban areas, thereby enhancing

regional resilience and sustainability (Kitchin, 2014; Nam & Pardo, 2011). UBT's initiative positions the university as a regional leader in smart city research and innovation, fostering cross-border knowledge exchange and contributing to policy formulation beyond Kosovo's borders.

Thus, it is to conclude that UBT's SMART City initiative advances planning education and practice by integrating technology, sustainability, and entrepreneurship in a real-world setting, offering a replicable model for other emerging economies. Its ongoing development promises significant impacts on regional urban transformation, equipping future planners with the tools and mindset to design adaptive, inclusive, and resilient cities (Georges et al., 2020; Angelidou, 2014).

Conclusion: Building a Sustainable Future through Education

The role of education in promoting urban sustainability is multifaceted and far-reaching. From early childhood education to higher learning, from community engagement to leveraging technology and policies, education is the cornerstone of a sustainable urban future.

Investing in sustainability education is an investment in our collective future. It empowers individuals to make informed choices, inspires innovation in sustainable practices, and strengthens communities to work together towards common goals. As we strive to create sustainable cities, the knowledge and values imparted through education will be our guiding light, ensuring that urban development progresses in harmony with environmental stewardship and social well-being.

Contemporary UPE is essentially rooted in the sustainable development paradigm, and its principles are part of the curricula of planning schools throughout the developed world. In the 1990s, the growing significance of the environment exerted a major influence on changes to UPE. Following the Brundtland Report, rising global environmental concerns caused the purpose of planning to shift from the seemingly benign management of environmental change to the explicitly normative goal of achieving sustainable development (Davoudi and Pendlebury, 2010). At this time, it became commonplace to see planning as having to be basically oriented toward solving the needs of society within the framework of sustainable development (AESOP, 1995).

However, there are no common core curricula or even universally agreed guidelines for UPE, and even within Europe, planning schools do not agree on the competences professional planners should have (Frank et al., 2014; Mironowicz, 2015). Although some authors have suggested the development of a uniform Western planning doctrine (Kunzman, 2004), there is a considerable need to adapt planning to local circumstances and to recognise the specific features of the environment in which the planning education curriculum and educational approach are applied (Frank et al., 2014; Mironowicz, 2015). Political and socio-cultural realities and specific environmental and ecological challenges make the contextual grounding of UPE essential.

11. References

- Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, 22(1), 3-21.
- Angelidou, M. (2014). Smart city policies: A spatial approach. *Cities*, 41, S3-S11.
- Angelidou, M. (2015). Smart city strategies: A comparative analysis of European smart city strategies. *Cities*, 41, 10-20.
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481-518.
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology*, 18(2), 65-82.

- Cocchia, A. (2014). Smart and Digital City: A Systematic Literature Review. In Smart City (pp. 13-43). Springer.
- Dameri, R. P. (2013). Searching for smart city definition: a comprehensive proposal. *International Journal of Computers & Technology*, 11(5), 2544-2551.
- Georges, L., Anagnostopoulos, T., & Koutsopoulos, I. (2020). The role of universities in smart city innovation ecosystems. *Sustainability*, 12(9), 3614.
- Haughton, G., & Hunter, C. (2004). *Sustainable cities*. Routledge.
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79, 1-14.
- Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference* (pp. 282-291).
- Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities*, 38, 25-36.
- Sisson, A., & Stough, R. R. (2017). The Changing Role of the Planner: Planning for Smart and Sustainable Communities. *Journal of the American Planning Association*, 83(3), 191-203.
- Townsend, A. M. (2013). *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. W.W. Norton & Company.
- Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science*, 6(2), 203-218.
- Alizadehsalehi, S., Hadavand, A., & Huang, J. (2020). Virtual Reality for Smart Urban Planning and Smart City Design. *Smart Cities*, 3(2), 373-388.
- Batty, M. (2018). Artificial intelligence and smart cities. *Environment and Planning B: Urban Analytics and City Science*, 45(1), 3-6.
- Carayannis, E. G., & Campbell, D. F. (2009). 'Mode 3' and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3/4), 201-234.
- Cavada, M., Hunt, D. V. L., & Rogers, C. D. F. (2016). Smart Cities: Contradicting Definitions and Unclear Measures. *Smart Cities and Regional Development Journal*, 1(1), 7-19.
- D'Alessandro, S., & Zuluaga, L. A. (2022). Planning education for urban sustainability: critical perspectives and reform agendas. *Journal of Planning Education and Research*, 42(3), 276-288.
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy*, 29(2), 109-123.
- Friedmann, J. (1996). The core curriculum in planning revisited. *Journal of Planning Education and Research*, 15(2), 89-104.
- Gunder, M. (2010). Planning as the ideology of (neoliberal) space. *Planning Theory*, 9(4), 298-314.
- Mulder, F. (2017). Strategic Framework for Open Educational Resources: Beyond the OER movement. *Open Praxis*,

9(1), 79–90.

OECD (2020). Cities in the World: A New Perspective on Urbanisation. OECD Urban Studies.

Portman, M. E., Natapov, A., & Fisher-Gewirtzman, D. (2015). To go where no man has gone before: Virtual reality in architecture, landscape architecture and environmental planning. *Computers, Environment and Urban Systems*, 54, 376–384.

Sterling, S. (2001). *Sustainable Education: Re-visioning Learning and Change*. Green Books.

UNESCO (2017). *Education for Sustainable Development Goals: Learning Objectives*.

UN-Habitat (2016). *The New Urban Agenda*.

UN (2015). *Transforming our World: The 2030 Agenda for Sustainable Development*.

WCED (1987). *Our Common Future (The Brundtland Report)*. World Commission on Environment and Development.

Asheim, B., & Isaksen, A. (2002). Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge. *Journal of Technology Transfer*, 27(1), 77–86.

Autio, E. (2014). Entrepreneurial Innovation: The Importance of Context. *Research Policy*, 43(7), 1097–1108.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation. *Progress in Human Geography*, 28(1), 31–56.

Bercovitz, J., & Feldman, M. (2008). Academic Entrepreneurs: Organizational Change at the Individual Level. *Organization Science*, 19(1), 69–89.

Cohen, B. (2006). Sustainable Valley Entrepreneurial Ecosystems. *Business Strategy and the Environment*, 15(1), 1–14.

Feldman, M., & Zoller, T. D. (2012). Dealmakers in Place: Social Capital Connections in Regional Entrepreneurial Economies. *Regional Studies*, 46(1), 23–37.

Isenberg, D. (2011). *The Entrepreneurship Ecosystem Strategy as a New Paradigm for Economic Policy: Principles for Cultivating Entrepreneurship*. Babson Entrepreneurship Ecosystem Project.

Mason, C., & Brown, R. (2014). *Entrepreneurial Ecosystems and Growth Oriented Entrepreneurship*. OECD LEED Programme.

Martin, R., & Sunley, P. (2011). Conceptualizing Cluster Evolution: Beyond the Life Cycle Model? *Regional Studies*, 45(10), 1299–1318.

Rogers, E. M. (2003). *Diffusion of Innovations* (5th ed.). Free Press.

Spigel, B. (2017). The Relational Organization of Entrepreneurial Ecosystems. *Entrepreneurship Theory and Practice*, 41(1), 49–72.

Stam, E. (2015). Entrepreneurial Ecosystems and Regional Policy: A Sympathetic Critique. *European Planning Studies*, 23(9), 1759–1769.

- Albino, V., Berardi, U., & Dangelico, R. M. (2015). Smart Cities: Definitions, Dimensions, Performance, and Initiatives. *Journal of Urban Technology*, 22(1), 3-21.
- Batty, M., Axhausen, K. W., Giannotti, F., Pozdnoukhov, A., Bazzani, A., Wachowicz, M., ... & Portugali, Y. (2012). Smart cities of the future. *The European Physical Journal Special Topics*, 214(1), 481-518.
- Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal*, 79, 1-14.
- Nam, T., & Pardo, T. A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. In *Proceedings of the 12th Annual International Digital Government Research Conference* (pp. 282-291).
- Neirotti, P., De Marco, A., Cagliano, A. C., Mangano, G., & Scorrano, F. (2014). Current trends in Smart City initiatives: Some stylised facts. *Cities*, 38, 25-36.
- Sisson, A., & Stough, R. R. (2017). The Changing Role of the Planner: Planning for Smart and Sustainable Communities. *Journal of the American Planning Association*, 83(3), 191-203.
- Wiek, A., Withycombe, L., & Redman, C. L. (2011). Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science*, 6(2), 203-218.